ON THE COLLOID-CHEMICAL ACTION OF THE DIURETIC SALTS[1]

THIS paper reports a further series of experiments on rabbits which show that *the colloids of the cells and of the juices which bathe them (blood and lymph), and the state in which these exist determine in the main the amount of water such cells and body fluids hold under both normal and abnormal conditions.*

The maintenance of a urinary secretion depends upon two factors, first, upon a supply to the kidney of "free" water out of which to make urine, and second, upon the ability of the kidney cells to do the work necessary in transferring the water from the blood into the uriniferous tubules. Urinary secretion may fail through interference with either of these factors.

The intravenous injection of any amount of blood, blood serum, or a hydrophilic colloid in which all the water is bound to the colloid, is followed by no increase in urinary secretion. This is because no "free" water is given. The same amount of water when given "free," as in the form of a saline solution, is followed by a prompt increase in urinary flow.

When equal amounts of sodium chloride solution are injected we get increasingly greater amounts of urine with progressive increase in concentration of the salt. This is because the salt dehydrates the body tissues, and the "free" water thus obtained is added to that which is being injected. The salt owes its action as a diuretic primarily not to any effect upon the kidney, but to its action in dehydrating the colloids of the whole body.

When equal amounts of equimolecular solutions of different salts are injected it is found that the order in which these produce diuresis is the same as the order in which they dehydrate (protein) colloids. Thus in a series of chlorides the metals arrange themselves in the following order, in which that most powerful in producing a diuresis is named last: sodium, magnesium, strontium, calcium. In a series of sodium salts the acid radicals arrange themselves as follows: chloride, nitrate (?), bromide, iodide, acetate, phosphate, sulphate. The greatest diuresis of all is produced by a salt which is made up of a powerfully dehydrating base with a powerfully dehydrating acid, for example, magnesium sulphate.

The diuretic action of these different salts parallels completely their dehydrating effect upon (protein) colloids, a fact which again indicates that they owe their action primarily to their effect upon the body as a whole, acting as diuretics only as they furnish a working kidney "free" water.

The experiments also betray no evidence of an antagonism between monovalent salts such as those of sodium, and bivalent salts such as those of calcium, strontium, etc. Such salts act *synergetically,* not antagonistically, in physiological reactions, just as they do in test-tube experiments on simple protein colloids.

It is impossible to explain these salt effects upon any osmotic basis, for there exists not even the grossest parallelism between the physiological effect and the osmotic pressure of the solutions employed. Our critics have maintained that osmotic phenomena dominate the picture of absorption and secretion in "living" tissues. They have grown willing to grant that the colloidal theory is operative in "dead" tissues. In the described experiments the osmotic element can hardly be found; the colloidal element appears plainly in every one of them. It is needless to add that our rabbits were alive.

The detailed laboratory findings upon which this article is based have been submitted for publication in the *Kolloid Zeitschrift.*

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[1] A preliminary communication.

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and sixty-third regular meeting of the American Mathematical Society was hald at Columbia University on Saturday, April 26, extending through the usual morning and